Saskatchewan
Agriculture, Food
and Rural
Revitalization

ADF

AGRICULTURE DEVELOPMENT FUND

FINAL REPORT

20020189

ACCESSING ECONOMICAL AGROFORESTRY PLANTING EQUIPMENT FOR AUTOMATED AFFORESTATION IN SASKATCHEWAN

Funded by:
The Agriculture Development Fund

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Prepared by: Prairie Agricultural Machinery Institute

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AGRICULTURE DEVELOPMENT FUND
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Report

Accessing Economical Agroforestry Planting Equipment For Automated Afforestation In Saskatchewan

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Acknowledgement

PAMI wishes to acknowledge the funding support provided by the Saskatchewan Forest Centre and the Agricultural Development Fund of Saskatchewan Agriculture, Food and Rural Revitalization.

1. Summary

There is increasing interest in Saskatchewan in agroforestry and subsequently in the planting of large areas of farmed land to plantation poplar or softwoods. Currently, available tree planting systems have been developed either from re-forestation needs or for single row planting of shelterbelts. Both systems are labour intensive. They are not suited to low cost planting of large areas, which is a critical requirement for agroforestry to be feasible in Saskatchewan. Machinery is needed for automated preparation of cuttings and automated planting of both cuttings and seedlings. Plantation forestry has been used for several years in the Pacific Northwest and South East, US, as well, in a number of locations in Europe. This project was to determine what machinery is now available and to develop a listing of the source, specifications, and descriptions of the machinery. All of the information obtained has been included in the Agroforestry Planting Equipment guide in **Appendix I**.

While a number of machines were located, there may be more work required to adapt them to large-scale afforestation in Saskatchewan conditions. Some of the manufacturers have expressed a willingness to carry on such developmental work if there is a sufficient market for the machines to justify it.

Saskatchewan producers interested in afforestation planting machinery can determine their current options to best plant tree seedlings and cuttings in an automated and cost efficient manner from a review of the guide.

2. Technical Report

2.1 Background and Objectives

There has been an increasing interest in agroforestry in the province of Saskatchewan. This interest is in the planting of large areas of farmland into plantation poplar or softwood. Currently, the most common method of planting is done by hand or using a one-row planting system. These methods are both labour intensive and time consuming.

The objective of this project was to determine what machinery is available for the purpose of planting tree seedlings and cuttings in an automated and cost efficient manner. From this information a listing of the source, specifications, and description of the machinery was developed.

2.2 Project Description

The purpose of this project was to obtain all available information on any machine in North America or Europe that is available for automated tree planting or that could be adapted to automate the planting for large-scale afforestation. In particular, machinery for the process of cuttings preparation and cuttings placement at precise location was examined. The Internet and International Library databases were searched and forest industry contacts were consulted to find leads. The extensive list of contacts is included in **Appendix II**. Most of the information was obtained by telephone and Internet.

2.3 Results and Discussion

After some research into the needs for planting in Saskatchewan, PAMI's initial search began by looking for an ideal machine with the following requirements:

- Target planting rate to be one-quarter section per machine per day planting, about 5,000 cuttings, in a precision spacing of rows 8 to 10 ft (2.4 to 3.0 m).
- The machine must seed into regular annual crop fields (not clear cut forest) and be able to withstand stones and maintain precise seeding depth in rolling topography.
- The ideal machine will be 40 ft (12 m) wide with planters at 8 to 10 ft (2.4 to 3.0 m) spacing and capable of a good ground speed to handle the required acres per day.
- The machine must auto-feed and auto-plant with no labour except for loading seedlings and driving the tractor or self-propelled machine.
- The auto-feeder must feed cuttings 0.38 to 0.75 in (0.9 to 1.9 cm) in diameter to the auto-planter.

- Auto planter must open ground, place the cutting vertically in the soil 9 in (23 cm) deep with 1 to 1.5 in (2.5 to 3.8 cm) above the surface, and close and pack the soil around the cutting.
- Cutting feed mechanism must hold enough cuttings to do large acres without reloading.

The listing is the result of an extensive search that was started by using the Internet, forestry industry contacts, and by completing a patent search for any type of machinery which would be similar to the requirements set. A list of all contacts made is listed in **Appendix II**. A number of the contacted people did not see the need for automating the planting because of the accessibility of a low cost work force for them. They also noted there were some problems with damage to the cuttings and the accuracy needed when planting the cuttings for use of a drip line irrigation system.

The following companies were found to have some type of planting system, which could be pulled behind a tractor. Some of these units are manual planting machines and some are semi automated:

- Salixsphere - Step Planter
- J.E. Love Company - SP1200 Intermittent Tree Planter
- CHR Design and Testing Inc. - CHR Tree Planter
- Advantage Design Engineering - HCP-3 Hardwood Cuttings Planter
- Whitfield Forestery Equipment - Model ST-630
  - Model 9700-HC
  - Model SP-3202
- Timm Enterprises Ltd. - Egedal Transplanter Type Hydromatic

Salixsphere - Step Planter

The Step Planter is made by a Swedish company and was found during an Internet search. The Technical Development Branch of the United Kingdom Forestry Commission conducted a study and issued a report on the *Further Evaluation Of Planting Machines For Short-Rotation Coppice*. PAMI was unable to obtain the report due to the fact that it was not completed for publication. A summarized report was obtained off the Internet along with a summarized report of *A Trial Of Suitable Planting Machines For Project ARBRE*. The report evaluated four different companies and the Salixsphere Step planter was rated as giving the best results. The Step Planter is probably the machine that best automates the planting process. The company was contacted and information on the Step Planter was supplied along with information on other types of equipment available. These other types of equipment include a Rodster and Bundler, which are whip-harvesting machines. The specifications on the planter

can be found in the Agroforestry Planting Equipment guide along with information on the whip harvesters.

J.E. Love Company- SP1200 Intermittent Tree Planter

Contact was made with the J.E. Love Company through Brain Vachowski who works for the Missoula Technology and Development Centre. Brian contacted the J.E. Love Company, who in turn contacted PAMI about their cuttings planter. This company manufactures two planters and a tree seedling harvesting system. James is willing to supply a quote to design, develop, and manufacture a system to meet the requirements specified. Specification for the SP1200 can be found in the Agroforestry Planting Equipment guide.

CHR Design and Testing Inc. - CHR Tree Planter

This planter was discovered through a contact at the University of Minnesota, Wendell Johnson. Clarence Rail is a retired John Deere Engineer who has patented a tree-planting machine. This patent is based on his second design version of the unit. The unit is a two-row system with one person feeding the cuttings into a conveyer. The conveyer then delivers the cutting to the planting mechanism, which drives them into the ground using a hydraulic cylinder. Clarence informed PAMI that 5% of the cuttings do have some slight damage and that they are working on improving the hammering mechanism to prevent wear. This unit is still in the prototype development stage. The machine has planted trees in the states of Oregon and Washington.

Advantage Design Engineering - HCP-3 Hardwood Cuttings Planter

This planter was developed by the US Department of Agriculture, and is based on the tree planter, which originated at the Indian Head Provincial Nursery in Saskatchewan. Advantage Design Engineering (ADE) contracted with a state nursery in South Dakota to build one unit. ADE was contacted and is willing to build more units if required. PAMI has obtained drawings from the US Department Of Agriculture along with a drawing of a hardwood, cutting clamp used to hold the sticks in place while preparing the cuttings.

Whitfield Forestry Equipment - Model ST-630, Model 9700-HC, Model SP-3202

Whitfield is a manufacturer of numerous types of tree planting units. The three models added to the Agroforestry Planting Equipment guide were selected based on advice from Jim Whitifield. More information on the units can be found in the guide.

Timm Enterprises Ltd. - Egedal Transplanter Type Hydromatic

Timm Enterprises is a Canadian company which sells the Egedal line of products. Egedal is located in Denmark and they produce various types of nursery products.

PAMI has also contacted Kevin Hruska who runs Bridgeview Manufacturing in Gerald Saskatchewan. He has designed and built a prototype tree planter. It is a three-row planter with 8 ft (2.4 m) centers and on row packing. It uses a double shank opening system, one to slice the trench and another to clean. The trees are then hand planted into the furrow. He has informed PAMI that he is not interested in building just one unit but may be convinced to build an order of 10 or 20 units. He also stated that he is not interested in developing a completely automated system. Therefore, he has not been included as a manufacturer in the Agroforestry Planting Equipment guide.

2.4 Conclusions

The search for automated planting equipment led to the contact of a large number of individuals in the forest industry. Some of these individuals felt that there is now enough manpower available in their area to hand plant the cuttings; therefore, automated equipment is not required. The lack of demand for automated machinery is likely the reason there is difficulty in finding advanced equipment. Such equipment would be needed to fully automate the planting of cuttings on a large scale.

However, there are a few manufacturers that manufacture various types of planting equipment. Most of the equipment will open a planting trench and will either have the cuttings inserted by hand or mechanically fed into the ground. The machines that mechanically feed the cuttings into the ground still require manpower to feed the cuttings to the planting mechanism. Once the cuttings are inserted, the planters will then close and pack the soil around the cutting. The Salixsphere Step planter is one of the most automated planters on the market and is available in 2, 4, or 6-row sizing but it still requires manual feeding of the whips into the machine. It is also designed for planting into cultivated soil.

Because there is no demand or urgency to automate the planting procedure, it is likely that the equipment now available will not advance very much in the years to come unless a research and development initiative is undertaken.

3. Personnel

3.1 PAMI Manpower Supplied

It is PAMI's policy to charge rates that include salary and benefits of employees as well as overhead. These charge rates do not include profits and to ensure that overhead is not charged to the project, indirect services, management time, and use of PAMI equipment are provided at no cost. It has been calculated that this adjustment removes more than overhead costs from actual charge rates. It is PAMI's policy not to release individual salary information. As well, in this project PAMI has undertaken to provide a percentage of costs.

4. Equipment

No equipment was purchased for this project.

5. Project Materials

PAMI has produced 200 copies of Agroforestry Planting Equipment guide that will be given to the Saskatchewan Forest Centre for distribution. This guide lists nine planting machines that can be used to plant poplar cuttings. This guide will also be available on the PAMI web site.

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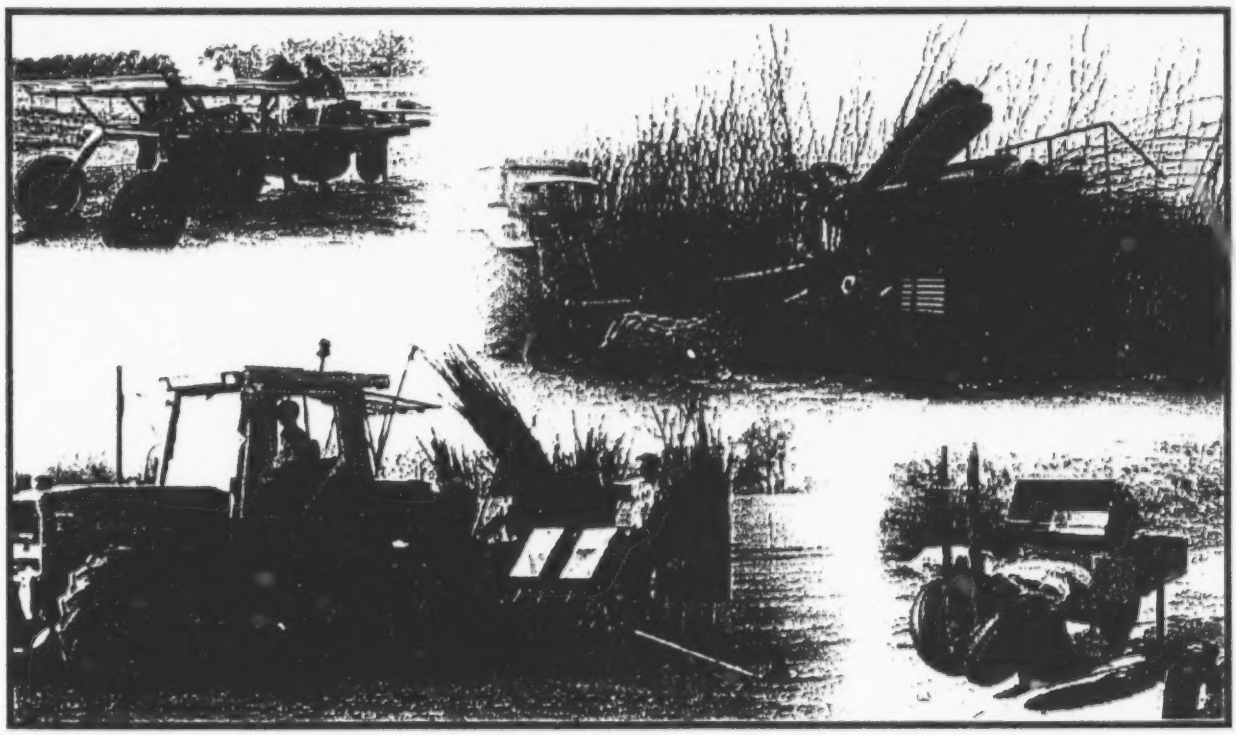
Appendix I

Agroforestry Planting Equipment Guide



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Agroforestry Planting Equipment Guide

Introduction to Agroforestry Planting Equipment

Machinery Listing

Machine Name	Manufacturer
Step	Salixsphere
SP1200 Intermittent Tree Planter	J.E. Love Company
CHR Tree Planter	CHR Design and Testing Inc.
HCP-3 Hardwood Cuttings Planter (MTDC-909)	Advantage Design Engineering
Model ST-630 Side Delivery Heavy-Duty Planter	Whitfield Forestry Equipment
Model 9700-HC Hardwood Semi-Automatic 3 pt Hitch	Whitfield Forestry Equipment
Model SP-3202 Two-Seat Heavy-Duty Transplanter	Whitfield Forestry Equipment
Egedal Transplanter Type Hydromatic	Timm Enterprises Ltd.
Rodster Mark II and Bundler	Salixsphere

We would like to acknowledge funding from the Agricultural Development Fund of the Saskatchewan Agriculture, Food and Rural Revitalization Fund.

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Introduction to Agroforestry Planting Equipment

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Agroforestry Planting Equipment Guide

Cuttings Planter

Step

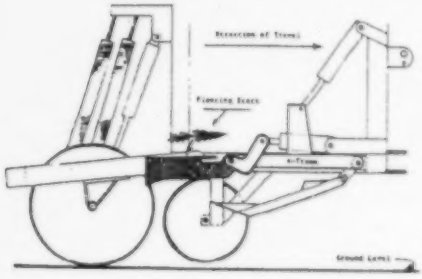
Manufacture:	**Salixsphere**
Address:	Hamre 1 SE - 776 90 Hedemora
Country:	Sweden
Phone:	+46 8 411 1068
Fax:	+46 8 21 9049
Contact Person:	Rodolfo Lindqvist - Marketing Director
Email:	rodolfo.lindqvist@salix.se
Website:	www.salix.se
Cost:	Not available
Power Requirements:	Preferably 4 wheel drive standard tractor minimum 70 hp (50 kW) engine
Speed:	Not available
Hydraulics:	Not available
Opener Type:	Coulter
Delivery Mechanism:	Mechanical
Planting Rate:	2 cuttings per second
Number of Rows:	2, 4, or 6
Soil closing/packing:	Steel wheels
Current location of Use:	Europe
Manual Labour:	2 to 4 (1 driver, 1 to 3 planters)
Dimension (4 row):	
Length:	6.23 ft (1.9 m)
Height:	4.92 ft (1.5 m)
Width:	10.20 ft (3.1 m)
Weight:	2,866 lb (1,300 kg) & 66 lb (30 kg) spares box

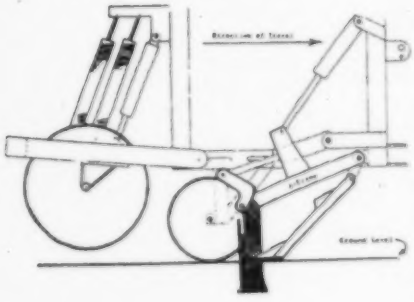
Description:

- Revolutionary technology created to reduce establishment costs for short rotation coppices, poplar, and other nurseries with a 98% cutting survival rate.
- Able to plant on slopes, in any kind of soil, and within certain limits even in stony soils.
- Supplied in three different models for the plantation of 2, 4, and 6 rows and in two types each, A and B. The plantation modules are mechanically driven from the tractor's pto and those are ingeniously designed to remain stationary for a moment while the tractor moves forward. This ensures that the cuttings are inserted in a vertical position, even at high planting speeds. For example, two cuttings per second and per module.
- Each one of the planting modules will follow the level contour of the ground.
- The cutting length, as well as the insertion height is easily adjustable.
- The planting is performed in a zigzag pattern to allow every plant, at any chosen spacing, the maximum growing space.

Cuttings Planter

SP1200 Intermittent Tree Planter





Manufacture:	**J.E. Love Company**
Address:	309 California Street P.O. Box 188 Garfield, WA 99130-0188
Country:	USA
Phone:	1-509-635-1321
Fax:	1-509-635-1434
Contact Person:	James Love
Email:	j_a_love@msn.com
Cost:	$20,000.00 US
Power Requirements:	Minimum 90 hp (67 kW)
Speed:	Varies on condition
Hydraulics:	24 gpm at 2,800 psi
Opener Type:	Knife
Delivery Mechanism:	Hydraulic
Planting Rate:	1 cutting per 3 seconds
Number of Rows:	1
Soil Closing/packing:	2, 18 in (45 cm) diameter wheels
Current location of Use:	United States
Manual Labour:	2 (1 driver, 1 planter)
Dimension:	
Length:	From 3 pt hitch mount 86 in (2.2 m)
Height:	75 in (1.9 m)
Width:	63 in (1.6 m)
Weight:	2,500 lb (1,134 kg)

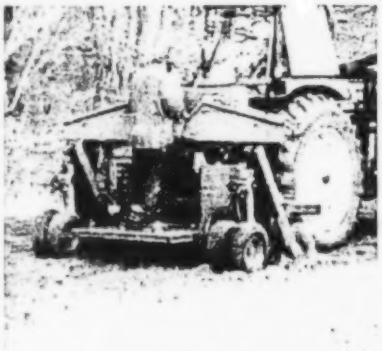
Description:

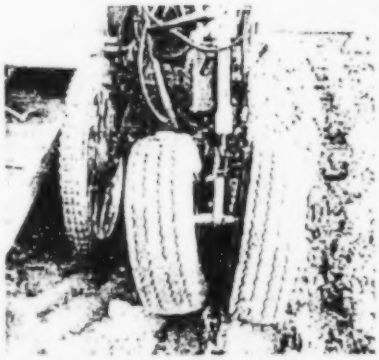
Planting Sequence:

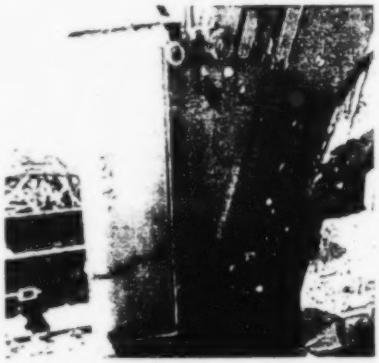
- When the machine is in load position, the operator loads the horizontal receptacle on the planting arm.
- The operator then initiates the cycle by depressing the foot switch.
- While the planting arm is still in a horizontal position, the A-frame is lowered.
- The amount the A-frame is lowered is based on the predetermined planting depth.
- Once the A-frame is lowered, the planting arm will rotate vertical and release the cutting.
- The cavity is then closed by the packing wheels.
- The planting arm will then be elevated from the soil while still vertical.
- Once elevated, the planting arm returns to the horizontal position and is then ready to be reloaded.

Cuttings Planter

CHR Tree Planter







Manufacture:	**CHR Design and Testing Inc.**
Address:	7129 NE 29th Street Ankeny, IA 50021
Country:	USA
Phone:	1-515-964-1162
Fax:	Not available
Contact Person:	Clarence Rail
Email:	Not available
Website:	Not available
Cost:	$15,000.00 to $20,000.00 US
Power Requirements:	Minimum 60 hp (45 kW)
Speed:	3.5 mph (5.6 kph)
Hydraulics:	11 gpm (42 L/min)
Opener Type:	Coulter
Delivery Mechanism:	Hydraulic
Planting Rate:	2 plants per 2.2 seconds 17.6 ac/hr (7.1 ha/hr)
Number of Rows:	2
Soil Closing/packing:	Rubber tires
Current location of Use:	USA
Manual Labour:	2 (1 driver, 1 planter)
Dimension:	
Length:	78 in (2.0 m)
Height:	60 in (1.5 m)
Width:	168 in (4.3 m)
Weight:	1,500 lb (680 kg)

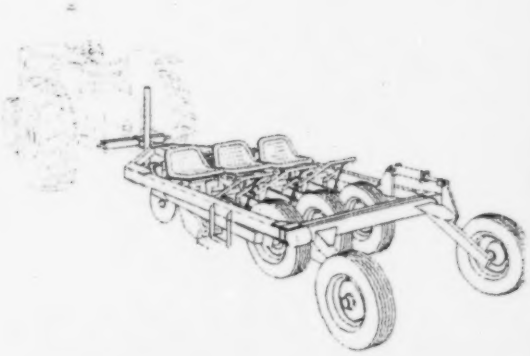
Description:

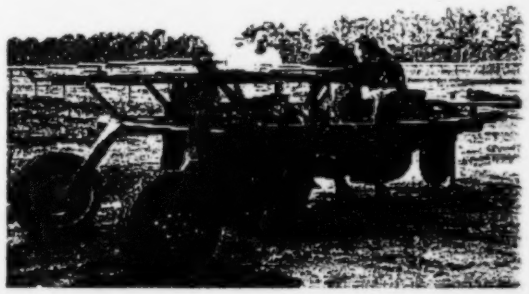
- One person stands on the back and places the cuttings into a slotted conveyer.
- The conveyer then feeds to the planters.
- The planters each have a hydraulic cylinder, which drives the cutting into the ground.
- The cuttings can be 9 in (23 cm) long ± 0.5 in (1.3 cm) and a maximum cutting diameter of 1in (2.5 cm). The two rows are spaced 8 to 12 ft (2.4 to 3.6 m) apart.
- Currently in prototype stage of development.

Cuttings Planter

HCP-3 Hardwood Cuttings Planter (MTDC-909)

Manufacture:	**Advantage Design Engineering**
Address:	Not available Madison, SD 57042
Country:	USA
Phone:	1-605-446-3413
Fax:	1-605-446-3159
Contact Person:	Eric Lewis
Email:	ademail@adeconsulting.com
Website:	www.adecomsulting.com
Cost:	$12,000.00 US
Power Requirements:	Minimum 50 hp (37 kW)
Speed:	Less than 1 mph (1.6 kph)
Hydraulics:	Dual- 16 gpm (60 L/min)
Opener Type:	Coulter
Delivery Mechanism:	2 hydraulic driven rollers
Planting Rate:	Set by work rate
Number of Rows:	3
Soil Closing/packing:	Rubber tire
Current location of Use:	USA
Manual Labour:	2 to 4 (1 driver, 1 planter per row)
Dimension:	
Length:	203 in (5.1 m)
Height:	56 in (1.4 m)
Width:	96 in (2.4 m)
Weight:	1,500 lb (680 kg)





Description:

The Model HCP-3 Hardwood Cuttings Planter is a three-row, production nursery planter for any species of hardwood cuttings up to 0.75 in (1.9 cm) diameter. The planter is designed to plant hardwood cuttings in a prepared soil bed. The cuttings are later lifted as a seedling at the end of the growing season. Production rates for the planter can be as high as 80,000 cuttings per day, with only four to five personnel. Labour savings are substantial, resulting in a return on investment period of 2 years or less, depending on nursery production.

Row spacing is adjustable from 18 to 24 in (46 to 61 cm). The maximum cutting size would be 0.75 in (1.9 cm) and a planting depth of 8 in (20 cm).

This planter is designed for automated planting of cuttings to produce seedlings but should be useful for planting stool beds.

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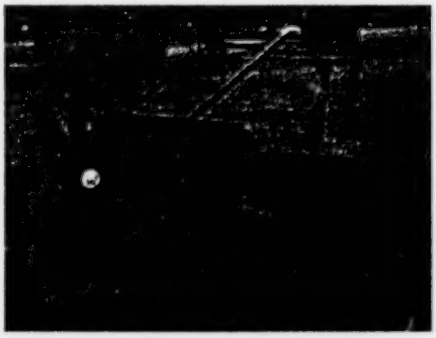
Agroforestry Planting Equipment Guide

Cutters Planter/Seedling Transplanter

Model ST-630 Side Delivery Heavy-Duty Planter



Manufacture:	**Whitfield Forestry Equipment**
Address:	6431 Mableton Parkway, SW P.O. Box 188 Mableton, GA 30126-0188
Country:	USA
Phone:	1-770-948-1212
Fax:	1-770-948-0155
Contact Person:	Not available
Email:	treesone@mindspring.com
Website:	www.whitfieldforestry.com
Cost:	$4,950.00 US
Power Requirements:	50-200 hp (37-149 kW)
Speed:	2-21/2 mph (3.2-4.0 kph)
Hydraulics:	Not available
Opener Type:	Coulter
Delivery Mechanism:	Manual
Planting Rate:	Approximately 4 ac/ hr (1.6 ha/hr)
Number of Rows:	1
Soil Closing/packing:	Rubber tires
Current location of Use:	USA
Manual Labour:	2 (1 driver, 1 planter)
Dimension:	
Length:	96 in (2.4 m)
Height:	60 in (1.5 m)
Width:	60 in (1.5 m)
Weight:	1,400 lb (635 kg)

Description:

Hitch: Heavy-duty seven position 3 pt hitch, Category II. Lift pins to accommodate different height lift arms on tractor 33.5 in (85.1 cm) lifting centers.

Main Beam: 0.75 x 5 in (1.9 x 12.7 cm) boxed bar steel. 0.75 x 6 in (1.9 x 15.24 cm) adjustable coulter arms with depth skids. Weight brackets supplied for four 100 lb (45.4 kg) weights (weights not included).

Coulter assembly: 0.5 x 32 in (1.3 x 81.3 cm) high carbon steel blade. Six-lug, heavy-duty hub with replaceable, sealed bearings.

Foot: 2 in (5.1 cm) high carbon steel trencher foot. Changeable pin-type point equipped with 2 or 3 in (5.1 or 7.62 cm) ID trencher plates. The planting depth is 10 to 12 in (25.4 to 30.5 cm).

Packing wheel Assembly: Choice of 12 or 15 in (30.5 or 38.1 cm) pneumatic packing tires. Adjustable packing spindles. Heavy-duty, four-lug hubs. Timken high-speed wheel bearings. Equipped with patented gumbo soil fold bracket.

Seedling Boxes: Two removable boxes.

Operator use: High back comfort seat, fixed seat bracket (adjustable). Rear opening 48 in (121.9 cm) high. Protective footrest, leg protectors, and handhold bars.

PAMI

Agroforestry Planting Equipment Guide

Seedling Transplanter for Large Seedlings

Model 9700-HC Hardwood Semi-Automatic 3 pt Hitch

Manufacture	**Whitfield Forestry Equipment**
Address:	6431 Mableton Parkway SW P.O. Box 188 Mableton, GA 30126-0188
Country:	USA
Phone:	1-770-948-1212
Fax:	1-770-948-0155
Contact Person:	Not available
Email:	treesone@mindspring.com
Website:	www.whitfieldforestry.com
Cost:	$12,320.00 US
Power Requirements:	125 hp (93 kW)
Speed:	Set by work rate
Hydraulics:	Not available
Opener Type:	Coulter
Delivery Mechanism:	Semi automatic planting
Planting Rate:	Set by work rate
Number of Rows:	1
Soil Closing/packing:	Rubber tires
Current location of Use:	USA
Manual Labour:	2 (1 driver, 1 planter)
Dimension:	
Length:	120 in (3.0 m)
Height:	86 in (2.2 m)
Width:	70 in (1.8 m)
Weight:	3,500 lb (1,587 kg)

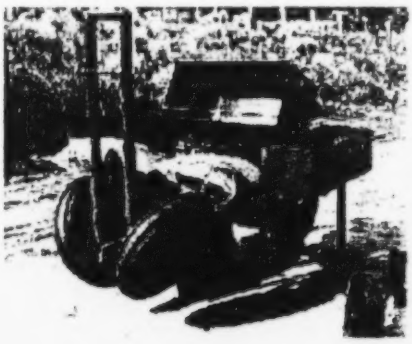
Description:
For use in subsoil trench. Plants hardwood seedlings with 5 to 6 in (12.7 to 15.24 cm) wide root system up to 4 ft (1.2 m) tall. Category II and III 3 pt hitch. Two large seedling trays. Adjustable padded comfort seat, rear wall padding.

PAMI

Agroforestry Planting Equipment Guide

Seedling Transplanter for Larger Seedlings

Model SP-3202 Two-Seat Heavy-Duty Transplanter



Manufacture:	**Whitfield Forestry Equipment**
Address:	6431 Mableton Parkway SW P.O. Box 188 Mableton, GA 30126-0188
Country:	USA
Phone:	1-770-948-1212
Fax:	1-770-948-0155
Contact Person:	Not available
Email:	treesone@mindspring.com
Website:	www.whitfieldforestry.com
Cost:	$6,248.00 US
Power Requirements:	60-150 hp (45-112 kW)
Speed:	Set by work rate
Hydraulics:	Not available
Opener Type:	Coulter
Delivery Mechanism:	Manual
Planting Rate:	Set by work rate
Number of Rows:	1
Soil Closing/packing:	Foam filled packing tires 12 or 15 in (30.5 or 38.1 cm)
Current location of Use:	USA
Manual Labour:	3 (1 driver, 2 planters)
Dimension:	
Length:	96 in (2.4 m)
Height:	38 in (1 m)
Width:	52 in (1.3 m)
Weight:	1,600 lb (726 kg)

Description:

Hitch: Heavy-duty seven position 3 pt hitch, Category II. Lift pins to accommodate different height lift arms on tractor. The lifting centers are 33.5 in (85.1 cm).

Main Beam: 0.75 x 4 in (1.9 x 10.2 cm) boxed bar steel. Adjustable coulter arms with depth skids. Weight brackets supplied for four 100 lb (45.4 kg) weights (not included).

Coulter Assembly: 0.5 x 32 in (1.3 x 81.3 cm) high carbon steel blade. Six-lug, heavy-duty hub with replaceable, sealed bearings.

Scalper - Choose either 26 or 32 in (1.3 or 81.3 cm) cutting width. Adjustable cutting depth. Replaceable, case-hardened, steel cutting edge.

Foot: High carbon steel trencher foot, 2 in (5.1 cm). Changeable pin-type point equipped with 2 and 3 in (5.1 and 7.6 cm) ID trencher plates. Planting depth 14 in (35.6 cm).

Packing wheel Assembly: Choice of 12 or 15 in (30.5 or 38.1 cm) foam filled packing tires. Adjustable packing spindles. Heavy-duty, four-lug hubs. Timken high-speed wheel bearings. Equipped with our patented gumbo soil fold bracket.

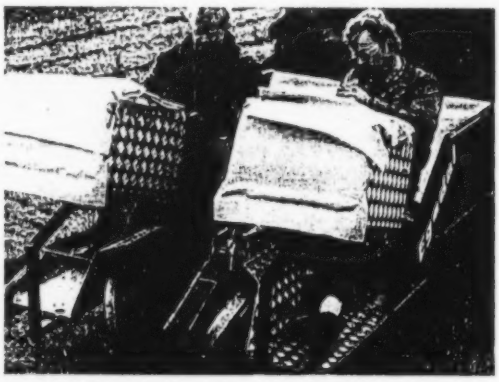
Seedling Boxes: Choice of C-1 center mount or C-2 side mount boxes.

Operator Use: Two high back comfort seats. Fixed seat bracket protective footrest and leg protectors. Safety handhold rods.

Miscellaneous: High arch opening through rear section for tall 4 and 5 ft (1.2 and 1.5 m) stock painted high gloss safety orange. Leg stands supplied.

Seedling Transplanter

Egedal Transplanter Type Hydromatic



Manufacture:	**Timm Enterprises Ltd.**
Address:	5204 Trafalgar Road PO Box 157 Oakville, ON L6J 4Z5
Country:	Canada
Phone:	1-888-769-8466, 1-905 878 4244
Fax:	1-905 878 7888
Contact Person:	Not available
Email:	mail@timmenterprises.com
Website:	www.timmenterprises.com
Cost:	$31,401.00 to $37,761.00 CDN
Power Requirements:	90 hp (67 kW)
Speed:	Set by work rate
Hydraulics:	Max 35 L/min 180 bar (gpm/psi)
Opener Type:	Roller share in combination with adjustable planting share, max. 13.5 in (35 cm) depth.
Delivery Mechanism:	Electric-hydraulic planting wheel where the planting distance is adjusted by means of the electric monitor. Planting distance 20-157 in (50 - 400 cm).
Planting Rate:	Capacity: 2,500 – 3,000 plants / hour
Number of Rows:	1 row
Soil Closing/packing:	The soil is pressed by means of 2 oblique iron pressure wheels
Current location of Use:	Europe
Manual Labour:	2 to 3 (1 driver- 1 to 2 planters)
Dimension:	
Length:	118 in (300 cm)
Height:	55 in (140 cm)
Width:	59 in (150 cm)
Weight:	2,645 lb (1,200 kg)

Description:

The Hydromatic is intended for planting bare root plants and smaller container plants on both cultivated as well as non-cultivated soil.

- The machine can handle plants at a height from about 7.5 to 50 in (20 to 130 cm).
- Great capacity for transplanting conifers and hardwood trees in fields, in woods, and in plantations.
- Ergonomically correct working position with specially designed planting wheel.
- Electronic setting of the planting distance.
- Well qualified for all types of land areas.
- Standard 3 pt hitch.

Cuttings Harvester

Rodster Mark II and Bundler

Manufacture:	**Salixsphere**
Address:	Hamre 1 SE - 776 90 Hedemora
Country:	Sweden
Phone:	+46 8 411 1068
Fax:	+46 8 21 9049
Contact Person:	Rodolfo Lindqvist - Marketing Director
Email:	rodolfo.lindqvist@salix.se
Website:	www.salix.se
Cost:	$65,000.00 to $130,000.00 CDN
Power Requirements:	Approx 140 hp (104 kW)
Speed:	Not available
Current location of Use:	Europe
Manual Labour:	1 (1 driver)
Dimension:	
Length:	Not available
Height:	Not available
Width:	Not available
Weight:	Not available

Description:

Rodster - a non-row specific whole stick harvester for stems up to 4 in (10 cm) in diameter. It was introduced in 1996. It guarantees no damage to the stems. Therefore, higher germination rates for the cuttings are achieved.

The Rodster Mark II is the second version of the Rodster. This machine is bigger and simpler then the first version, and it uses only one conveyor. The shoots are laid horizontal by a trip step placed below and in front of the deck – under the conveyor itself. The clearance between the two conveyor chains can be adjusted manually by the action of the telescopic boom that connects them. This way, one can match conveyor clearance to shoot diameter and work with a broader range of stem sizes. The machine can easily harvest 3 in (80 mm) diameter shoots and is suitable for the harvesting of young poplar in nurseries for re-planting to long rotation forestry. The machine is adjustable to a maximum diameter up to 6 in (150 mm), but harvesting stems of this diameter has not yet been tested. The left side of the deck table can fold vertical and if one activates the deck conveyor chains while in this configuration, the machine will "roll" incoming stems and form a tightly packed load. Once the deck is full, one can dump the load in the field or extract to an appropriate collection site. During extraction, the conveyor assembly is raised over the trailer beam, which is then straightened up for fast travel.

Bundler - the direct bundling harvesting system was initiated in 1997. This harvesting technique enables the economic storage and sun drying of the harvested biomass for year-round fuel supply i.e. for green power DME-projects.

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Appendix II

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